# The
# Ballarat
# Naturalist

December 2016

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## 2016 Stella Bedggood Memorial Lecture

*Fire in Lowland Grassy Ecosystem* –presented by Dr John Morgan

The 38th Annual Stella Bedggood Memorial Lecture was presented to 54 club members and visitors by Dr John Morgan, a grassland ecologist from La Trobe University's Department of Ecology, Bundoora. John's topic for the evening was *Fire in lowland grassy ecosystems,* focusing on its implications for conservation.

John began by remarking that this was the best recorded flowering year in the grasslands since 1996, making it a great time to visit them (which the club was planning to do for its field-trip on the following Sunday). The Victorian Volcanic Plains grasslands south of Ballarat occur on the third largest volcanic plain (lava flow) in the world.

Studies show that the plains erupted five million years ago, but *Themeda triandra* (Kangaroo Grass) only shows up in Victorian records for the last million years. *Themeda* was not a Gondwanan plant, i.e. it was not growing in Australia when the continents split up, but rather moved from South Africa, via Asia into northern Australia about 2 million years ago, then taking another 1 million or so years to finally reach Victoria. Thus, with *Themeda* being a relatively recent arrival, the plains have not always looked as there do now.

the plains have not always looked the way they do now, Grasslands are not commonly thought of as 'old growth ecosystems' yet many of the plants growing in them can live for centuries. For instance, *Ptilotus macrocephalus*, Featherheads, have an underground stem as long as your arm that supports half a dozen leaves and a few fluffy flower heads each year. They are effectively underground trees. The critically endangered Spiny Rice-flower, *Pimelea spinescens*, likewise has an extended, thick underground 'trunk' supporting a rather delicate-looking above ground plant. These plants have the capacity to re-sprout from underground parts year after year after year, unlike the ephemeral plants in ecosystems in arid zones that die off completely and only germinate from seed when conditions are right.

In the absence of fire or grazing, *Themeda* tends to smother itself , and everything else, in about 10 years by growing quickly and having leaves that only live for about 6 months. The dead material then simply accumulate to eventually smother the tussock. Something must have been removing the dead material to keep the grass in check and healthy, thus allowing other species to co-exist. Consequently fire is thought to have been really important in the maintenance of *Themeda*-dominated grasslands, removing the dead material and opening up the inter-tussock spaces to maintain the health, vigour and diversity of the ecosystem.

## Research into burning of grassland

John is currently working with his students to try and refine the nuance of how important fire is. They are looking at: how native grasses respond to fire, what happens when people start putting fire back into landscapes that have not had it for about 100 years, how exotic species affect fire outcomes in grassland, and the role of Aboriginal burning and how important it might have been in maintaining grasslands.

Kangaroo Grass is the most well-studied grass in the world. It is actively growing in summer, i.e. a $C_4$ grass, dormant over winter and as a tussock grass it protects its growing points from the effects of fire. The individual tussocks can live for 100 years and account for 90-95% of the cover in many temperate grasslands. Study sites dominated by *Themeda* that were initiated by Cliff Beauglehole in the 1970's have been revisited in the 1990's and 2000's and show that when you don't burn these grasslands, the probability of other species disappearing increases significantly.

Paradoxically, fire is needed to keep *Themeda* in check, reduce biomass and provide space for other species to co-exist, but it also enables *Themeda* to maintain its dominance. The tussocks are long-lived as, year after year, they re-sprout vigorously after fire. *Themeda* seedling-germination only occurs after fire when the thatch is removed.

John then highlighted the paucity of research undertaken to investigate the impact of fire on other native grass species that have had a much longer history in Australia. For example, Spear grasses, *Aus-*

*trostipa*, evolved about 25 million years ago in Australia - the true Australian element of grasslands. They are a winter-growing grass (a $C_3$ grass), like the Wallaby Grasses, *Rytidosperma*. The lack of research is concerning because these grasses represent tremendous diversity and are a very significant component of the temperate grassland biome: 64 genera, about 400 species and around 11% of Victoria's floral species.

Recent research has been a dream come true for his team of scientists - they have been required to set fire to things! Their research compared the response of 52 species from 37 genera of Poaceae, members of the grass family. Mortality rates and vigour of re-sprouting were monitored and compared between individual species as well as between the $C_4$ and $C_3$ grasses. All 21 genera of the $C_4$ grasses survived the burning trials, whereas 12 $C_3$ grass species died including *Dichelachne rara*, the Common Plume-grass, representing 15% of the $C_3$ grasses tested. Further research to test the effect of burning these genera at various intervals is required to see how it impacts their ongoing survival and re-sprouting vigour.

There is now a big push by land management agencies to re-introduce fire into grasslands that have been long unburnt. Whilst some of the science seems to support that approach, it is clear that fire should be re-introduced with caution and careful monitoring and adaptation of plans. This is because there are not yet much data about these fires and the impact that they are having on the survival of both vertebrate and invertebrate species on the sites. Nor is there evidence of the impact of fire on the native grass and herb species and their various mechanisms for regeneration from seeds and re-sprouting from underground stems.

In the absence of fire, species composition is generally quite different to that found on regularly burnt sites. More fire-sensitive plants have often moved in, including native $C_3$ grasses like *Poa*, *Rytidosperma* and *Austrostipa*. Also there is the moving in of weeds which often interact with fire differently to the native species because their 'fuel' characteristics are quite different to *Themeda*-dominated grasslands. The research team measured the rate of spread of the fire and the fire intensity in burns on long-unburnt sites still dominated by indigenous species, though not *Themeda* and on sites now dominated by the introduced grassy weed, Canary Grass, *Phalaris aquatica* and compared the results with those seen in *Themeda*-dominated grasslands.

*Christmas Breakup - Sun Dec 4*

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| *1.30 pm* | *Depart Gillies St. for new Canadian Regional Park* |
| *4.00 pm* | *Arrive at Buninyong Botanical Gardens for cuppa* |
| *4.20 pm* | *A conducted tour of the Gardens* |
| *5.00 pm* | *Picnic tea in the gardens* |

*Other details will be available at the Dec. meeting.*

The results showed that high quality remnant grasslands, dominated by species like Spear Grasses, *Austrostipa*, Wallaby Grasses *Rytidosperma spp*. and herbs burnt at low intensities (about half that of Themeda grasslands). They only retained extreme temperatures (350°+) for half as long, with temperatures below the soil surface staying relatively low. On the other hand, the intensity in now-weedy grassland dominated by Canary Grass was four times as high as *Themeda*-dominated grasslands, and retained extreme temperatures for twice as long, with temperatures also getting hotter at greater depths in the soil profile. All of these conditions negatively impact the survival of seeds, surface and underground growing points, and the chances of survival for invertebrates in leaf litter and soil, and vertebrate fauna. Weeds are changing the way grasslands burn, and the changes do not bode well for the restoration of grassy ecosystems that have become overtaken by perennial grassy weeds.

### Discussion of Indigenous burning

The last area that John discussed was the hot topic of indigenous burning and the role it played in the formation of grasslands. Provocative books on the topic have recently been published, and land management agencies seems to be using aspects of indigenous burning to justify all sorts of fuel reduction burning activities, but how accurate is our knowledge of indigenous burning, its extent, impacts, aims and methodology? Not very accurate, it would seem. One of John's students, Paul, is currently bringing together data from many sources: from historical sources like diary entries of early explorers, landscape paintings from the 1800's, government ecosystem maps, the latest data in geological mapping, and rainfall modelling.

It is widely accepted that grasslands occur naturally where there is 30%+ clay content in the soil because in simple terms trees struggle to get enough moisture out of this clay in dry conditions, and drown when conditions are wet because they drain poorly. The other condition grasslands require is an average annual rainfall of greater than

400mm.

To see if indigenous burning activities were affecting the distribution or extent of grasslands, John's student is looking at areas where grasslands were historically recorded that don't have the pre-requisite conditions of high-clay content and rainfall. He has found a strong correlation between those areas and waterways/ waterbodies, as well as adjacent areas that do fulfill the pre-requisites for grasslands. It seems that the aboriginal people were probably expanding existing grassy patches and open areas in areas that were well-watered and thus very livable.

Dr Beth Gott's research shows that the diet of aboriginals changes from seeds to tuberous plants in 500mm+ rainfall areas, and given that tuberous plants prefer high light levels, they are more prolific in grassland. It is also consistent with the diary entries of Batman in 1835, who described aboriginal burns in controlled patches producing a mosaic of fire cover. The burning was undertaken in early autumn when tuberous perennials were dormant and had already shed their seeds. Augustus Robertson, chief Aboriginal Protector in the 1800s in the Geelong region, describes mounds of tuberous roots standing 6 feet high. With relatively small populations, they must have been collected in quite small areas. Fire would be perfect to promote their proliferation in such an area.

It appears that indigenous people (the Wathaurung in the case of much of the Victorian Volcanic Plains in the Ballarat region) did indeed have a localised role in grassland formation that was purposeful and targeted, providing prolific food sources and attracting other food sources, i.e. large herbivores. Whilst most of these areas have now been lost back to forests, or agriculture, or development, current research may provide a great opportunity for recognition and acknowledgement of indigenous occupation and productive management of particular sites, paving the way for reconciliation and new opportunities to re-involve the traditional owners in ongoing land restoration and management.

Emily Noble

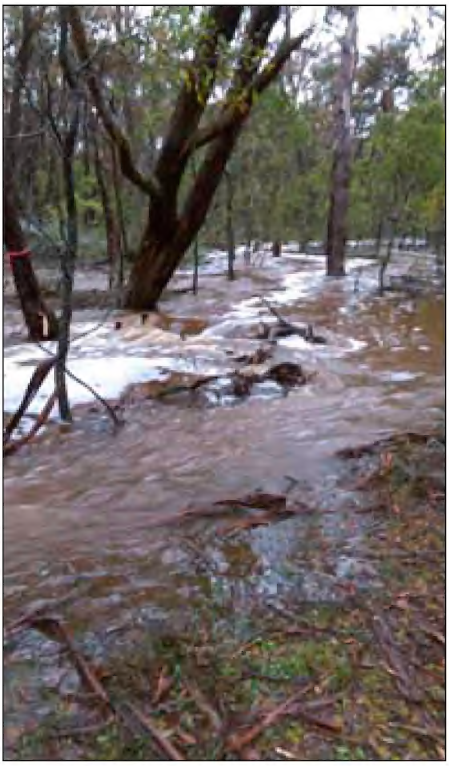
**Thank you to all contributors to *The Ballarat Naturalist***

The time and effort required is much appreciated.
In future, because of new slow postage system and the aim to get newsletters to members before the excursions, I would need to have contributions sent in by the Wednesday after the Committee meeting. The editor

## Further presentations from the Oct meeting

**Kathy Elder** made her first presentation to Field Nats with photos of recent rainfall and the results on her and Bill's property, *Stringybark*. Starting with what the Caledonian Creek usually looks like, a series of puddles, not always connected and more often dry during the past eight years they have been observing.

The next set of shots was of how much water flows down the creek after the higher rainfall events this winter compared to previous ones. In the past they have observed rafts of loose bark, sticks and other vegetation pushed up against trees, but found it hard to believe that water flow was responsible (see photo opposite).



The most recent event of approximately 75mm of rain in mid-Sept produced something extraordinary - some parts were 10 metres wide and 1 metre deep, flowing quickly (see photo opposite). Debris collected wherever there was a blockage. A new foot bridge was under water for a day and trapped a good pile of sticks and bark.

Kathy concluded by saying, "We are keeping an eye on where the water goes, planning for future dams and ponds for added habitat – and thanking our forethought for placing the house on the highest part of the block!"

Kathy Elder

**Bill Elder** presented a piece on the expansion of bulldog ant colonies on their property, *Stringybark*.

Ants can be important indicators of environmental conditions, so it pays to monitor what is out there. Our property *Stringybark* is 20 acres of bush adjacent to state forest south of Smythesdale. We plan to have little or no development of the 15 or so acres that is not yet

developed. There are three tracks that we use all the time in addition to the one around the boundary. I noted two colonies of the endangered Bulldog ant, *Myrmecia forficata* mainly because these were on the tracks and they were constantly disturbed by walkers and the occasional tractor and trailer.

To my great disappointment, these two nests appear to have been abandoned during summer. However, recently I have noticed new nests popping up – one, then two , then three. Then I checked the original two nests and found that there were active colonies at both.

It seems the more I wandered our tracks, the more nests I found. I showed photos of 7 new nests making a total of 9. There are plenty of other ant nests dotted around and are the most obvious including three nests of sugar ants, *Camponotus* sp. The next job is to explore further afield and see if I can find more ants generally. For the bulldog ants, I need to confirm the identification to see if they are the same species and then I will continue monitoring.

Bill Elder

## Book Review

***Beetle,*** *by Adam Dodd Reaktion Books, 2016. 192 pages with index, bibliography and notes.*

This is not just another book on beetle identification, ecology or behaviour. It is about the history and cultural influence of beetles on us. The author calls beetles the ‘living embodiment of biodiversity itself’ and it is easy to see the endless diversity that they provide. These insects are revealed as being among the most ancient and persistent creatures on the planet. They are so biologically successful that they can be found in every land environment. They are so abundant that there are an estimated 350,000 species, fully 25% of all known species of life on Earth with new discoveries made every day.

The book contains many photos, illustrations and plenty of solid facts, plus stories and observations on every aspect of beetle biology, history, mythology, art and folklore. The author says that most beetles, due to their camouflage, miniscule size and geographic isolation, remain unseen by human eyes. Yet their existence has been influential on so many levels. Indeed, Charles Darwin's first real experience of the natural world was that of beetle collecting – and look where that led.

More in-depth information is given for a variety of beetles such as: the ladybirds and stag beetles and their significance in religious symbolism, the dung or scarab beetles and their links to ancient Egypt and modern agriculture. The boll weevil, the cane beetle, the rhinoceros beetle and the jewel beetle all rate special mentions. Social and cultural references abound with the *Fab Four* and the *VW Beetle* treated seriously as expressions of admiration and emulation of our coleopteran friends. Australia has its fair share of beetle references given by the author, locally-based at the University of Queensland.

Dodd discusses beetles as pests, citing the Colorado potato beetle and the cane beetle, mong others, as examples. There are beetles as pets. You can buy them from vending machines in Japan, where insects, and beetles in particular, are an important part of the culture. In 2002 they imported 680 000 live beetles.

There are beetles as robots, remote controlled drones - stuff of science fiction. Beetles have been used as allegory in film and books.

*Beetle* is the latest in a series of fascinating publications dedicated to animals. Titles in the series include *Ant* and *Cockroach*, both published in 2003, and both of which adorn my shelves. They are compact yet comprehensive volumes which explore the basic biology of their subject as well as the wider impact each has had on the human psyche. Their importance in mythology, religion and science are described as is the history of food, the trade in animals and their products, as well as the artistic and literary imaginings inspired by each animal. There are about 80 titles so far, from Albatross to Walrus.

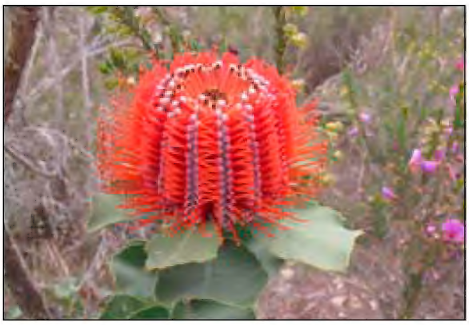
Reaktion Books are based in London and publish a similar series focussing on plants and their cultural and historical significance. All are full of good information, thoroughly researched and illustrated, readily available and are reasonably priced (around $25) and entertaining reading for all field naturalists.

Bill Elder

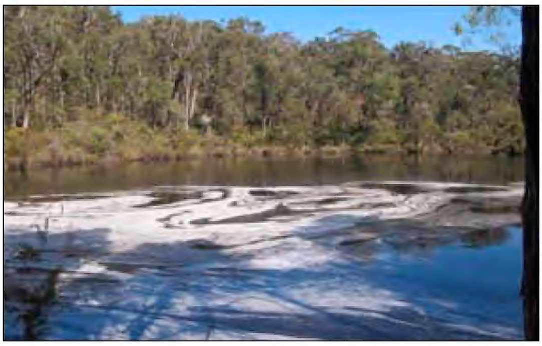
## Pre- and post-tours of Perth ANN Get-together

I went on the two week-long tours that Perth Nats, specifically Yolanda Keeble, organised so those of us, who flew across with time to spare before and after the main event, could see more of WA.

The first tour went north as far as level with Geraldton. We mostly visited national parks and bush reserves, viewing granite outcrops, as well as *The Pinacles* on our return. We were amazed at the numbers and variety of wild flowers that filled these areas. The most striking was fields of orange-yellow Waitzias in Coalseam Conservation Park and, at Depot Hill Reserve, lots of pink Waitzias and masses of pink and white everlastings– *Schoenia cassinia.* Purple *Dampiera*, pink feather flowers *Verticordia,* orange Catspaw were common in many reserves. We were also taken to two areas with the rare Wreath *Lechenaultia.* In all, it was a marvellous botanical tour.



The southern tour was very different, going inland as far as Albany and then back via the coastal areas. Highlights were seeing the Waratah Banksias *Banksia coccinea* (photo opposite) in one area of the Stirling ranges and further in, the flowering Hakeas at Bluff Knoll with their powerful perfume. We had sunny days around Albany area and stopped at scenic Green Pool and Elephant Rocks in Williams Bay. At Walpole we enjoyed a delightful boat trip across the Estuary to the narrow sea entrance.



On our return there was almost a straight line of pale-green sea water meeting the ink-brown water of the river-fed estuary. The tannin, *saponin* causing the colouring also gives a suds effect when stirred up – noted again at Rowel's pool (photo opposite) in the Timber Country. A walk at Cape Naturaliste took us to the whale lookout and we spied a number of Humpbacks in the distance on their annual migration.

Both tours had about 22 participants and we had mainly comforts of motel accommodation, also a good bus-driver and his wife, the hostess, who prepared lunches and snacks, giving us extra time for walks in many areas. Congratulations to Perth for such enjoyable tours.

Val Hocking

# Excursion: Victorian Volcanic Plains Grassland, Nov 5

As follow-up to the Stella Bedggood Memorial Lecture a number of Ballarat Field Naturalists participated in a tour of sites in the plains south of Ballarat.

Our **first stop** was on the road reserve of the **Mount Mercer Road** adjoining the Parks Victoria Grassland Reserve. The group was horrified to find that this site has been seriously invaded by the South African weed orchid *Disa bracteata.* This plant, a geophyte and deciduous perennial terrestrial orchid with underground tubers, self-pollinates and has tubers capable of vegetative reproduction. These-plants produce flowers in the second or third year. Each plant produces tens of thousands of seeds which can be readily dispersed by wind, water, stock, vehicles, machinery and people on clothing and shoes (even botanists are suspects!). The group spent much of the time at this site removing and carefully bagging up for proper destruction over 25 kg (wet weight) of this weed orchid.

A representative sample (in order of observation) of the native grassland species recorded for this site is included in Group 1, page 11.

The **second site** for the day was the extension to the **Rokewood Cemetery Reserve, (**see photo) where we stopped for lunch. We noted that good work had already been done by several Clubs in removing weed orchid plants and consequently hardly any weed orchids were evident at the site. The site is a joy to behold for its species richness and relatively weed-free condition when compared to many other related sites. A representative sample of native grassland species recorded for this site is included in Group 2, page 11.

Our **final site** visited on the day was the **Illabarook Rail Line, Nature Conservation Reserve** (NCR), Parks Victoria. The reserve had its origins as part of the cross-country railway from Irrewarra (east of Colac) to Newtown on the Skipton Branch line which operated between 1911 and 1953. This site is relatively intact and original earthworks (the old permanent way) and adjoining drains are readily discernable but the site has more recently suffered some significant weed invasion which included South African weed orchid. A representative sample of the native grassland species recorded for this site is included in Group 3, page 11.

Andy Arnold

**Group 1**

Themeda triandra
Rytidosperma caespitosa
Drosera peltata
Leptorhynchos squamatus
Caesia calliantha
Acaena echinata
Dichelachne sp.
Burchardia umbellata
Convolvulus remotus
Rumex brownii
Goodenia pusilliflora
Melicytus dentatus (on fenceline)

**Group 2**

Wahlenbergia communis
Asperula conferta
Microseris sp
Themeda triandra
Oxalis corniculatus
Convolvulus remotus
Hypericum gramineum
Pimelea curviflora
Caesia calliantha
Leptorhynchos squamatus
Chrysocephalum apiculatum
Rudidosis leptorrhynchoides
Burchardia umbellate
Rytidosperma caespitose
Ptilotus microcephalus
Diuris chrysiopsis
Brunonia australis
Thysanotus patersonii
Wahlenbergia stricta
Wahlenbergia sp.
Arthropodium strictum
Stackhousia monogyna
Cynoglossum suaveolens
Lomandra nana
Dianella revoluta
Cymbonotus preissianus
Austrostipa sp.
Acaena echinata
Convolvulus erubescens
Leucochrysum albicans var. tricolor
Pratia pedunculata
Microtus arenaria
Microtus unifolia
Lomandra filiformis
Dichelachne sp.
Pentapogan quadrifidus
Drosera peltata
Chrysocephalum semipaposum

**Group 3**

Drosera peltata
Arthropodium strictum
Burchardia umbellata
Pimelea humifusum
Allocasuarina verticillata
Cynoglossum suaveolens
Chrysocephalum apiculatum
Pelargonium rodneyanum
Acacia paradoxa
Gonocarpus sp.
Acaena echinate
Pimelea curviflora
Dianella revolute
Themeda triandra
Eryngium ovinum
Eragrostis brownie
Plantago gaudichaudii
Oxalis corniculatus
Goodenia pinnatifida
Wahlenbergia stricta
Acrotriche serrulata
Astroloma humifusum
Veronica gracilis
Solengyne dominii
Thelymitra nuda
Vitidinea cuneata
Caesia calliantha
Enchylaena tomentosa
Convolvulus remotus
Rumex brownie
Lissanthe strigosa
Ptilotus macrocephalus

# CALENDAR 2016

**December**

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|---|---|
| Fri 2 | *Mineral madness* - Steve Sorrell, club member |
| Sun 4 | Exc: *Afternoon at Canadian Forest & Buninyong Gardens for Christmas breakup* J Mildren & F Hanrahan *(see p .4)* |

**January 24** Committee meeting at Andy's

**February**

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| Fri 3 | *Rediscovering our club's history* - Susan Kruss, PhD student, Fed University |
| Sun 5 | Exc: *Scotsburn fire recovery* - John Gregurke, club member |

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## Committee

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|---|---|
| President | John Gregurke |
| Vice Pres | Fran Hanrahan |
| Secretary | Emily Noble |
| Treasurer | Les Hanrahan |

Claire Dalman
Peter Dalman
Bill Elder
Val Hocking
John Mildren
Andy Arnold

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**Meetings** are held at the Primary Industries Training Centre, cnr of Gillies and Gregory Sts, on the first Friday of the month at 7.30pm..

**Excursions**: Leave from the carpark at the Primary Industries Training Centre, cnr Gillies and Gregory Sts. at 9.30 am, unless otherwise advised.

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